

CLAIMS

1. A method for purifying 1,1-difluoroethane, comprising bringing crude 1,1-difluoroethane containing at least one compound selected from the group consisting of unsaturated compounds each having two carbon atoms within the molecule and saturated chlorine-containing compounds each having two carbon atoms within the molecule, into contact with an adsorbent comprising a zeolite having an average pore size of 3 to 6 Å and a silica/aluminum ratio of 2.0 or less and/or a carbonaceous adsorbent having an average pore size of 3.5 to 6 Å to reduce the content of said compound contained as an impurity in the crude 1,1-difluoroethane.

2. The method for purifying 1,1-difluoroethane as claimed in claim 1, wherein the unsaturated compound having two carbon atoms within the molecule is at least one compound selected from the group consisting of ethylene, fluoroethylene, vinyl chloride and vinylidene chloride.

3. The method for purifying 1,1-difluoroethane as claimed in claim 1, wherein the saturated chlorine-containing compound having two carbon atoms within the molecule is at least one compound selected from the group consisting of dichloroethane, 1-chloro-1-fluoroethane and 2-chloro-1,1,1,2-tetrafluoroethane.

4. The method for purifying 1,1-difluoroethane as claimed in any one of claims 1 to 3, wherein the total content of said compounds contained as impurities in the crude 1,1-difluoroethane is 0.1 vol% or less.

5. The method for purifying 1,1-difluoroethane as claimed in any one of claims 1 to 4, wherein the pressure for bringing the crude 1,1-difluoroethane into contact with said adsorbent is 1 MPa or less.

6. The method for purifying 1,1-difluoroethane as claimed in claims 1 to 5, wherein the total content of said compounds contained as impurities in the purified 1,1-difluoroethane is 100 vol ppm or less.

7. The method for purifying 1,1-difluoroethane as claimed in any one of claims 1 to 6, wherein the total content of unsaturated compounds each having two carbon atoms within the molecule, contained as impurities in the purified 1,1-difluoroethane is 50 vol ppm or less.

8. The method for purifying 1,1-difluoroethane as claimed in any one of claims 1 to 7, wherein the total content of saturated chlorine-containing compounds each having two carbon atoms within the molecule, contained as impurities in the purified 1,1-difluoroethane is 50 vol ppm or less.

9. The method for purifying 1,1-difluoroethane as claimed in any one of claims 1 to 8, wherein the crude 1,1-difluoroethane is obtained by a method comprising the following steps (1) to (3):

(1) a step of reacting 1,1-dichloroethane with hydrogen fluoride in the presence of a fluorination catalyst to obtain mainly 1,1-difluoroethane,

(2) a step of separating hydrogen fluoride, 1,1-dichloroethane and 1-chloro-1-fluoroethane from the product containing 1,1-difluoroethane obtained in the step (1) and circulating the separated compounds to a reaction step, and

(3) a step of separating, by distillation, hydrogen chloride and 1,1-difluoroethane from the product containing 1,1-difluoroethane obtained in the step (1).

10. A 1,1-difluoroethane product, which is 1,1-difluoroethane purified by using the method claimed in any one of claims 1 to 9, wherein the water content is 5 vol ppm or less.

11. A 1,1-difluoroethane product, which is 1,1-difluoroethane purified by using the method claimed in any one of claims 1 to 9, wherein the hydrogen fluoride content is 2 vol ppm or less.

12. A refrigerant comprising the 1,1-difluoroethane product claimed in claim 10 or 11.

13. An etching gas comprising the 1,1-

difluoroethane product claimed in claim 10 or 11.

14. A method for purifying 1,1-difluoroethane, comprising bringing crude 1,1-difluoroethane containing hydrogen fluoride and, as impurities, at least one
5 compound selected from the group consisting of unsaturated compounds each having two carbon atoms within the molecule, into contact with a fluorination catalyst in a gas phase state to reduce the content of the unsaturated compounds each having two carbon atoms within
10 the molecule.

15. The method for purifying 1,1-difluoroethane as claimed in claim 14, wherein the unsaturated compound having two carbon atoms within the molecule is selected from ethylene, fluoroethylene, chlorofluoroethylene,
15 vinyl chloride and vinylidene dichloride.

16. The method for purifying 1,1-difluoroethane as claimed in claim 14 or 15, wherein the total content of the unsaturated compounds each having two carbon atoms within the molecule, contained as impurities in the crude
20 1,1-difluoroethane, is 1 vol% or less.

17. The method for purifying 1,1-difluoroethane as claimed in any one of claims 14 to 16, wherein the fluorination catalyst contains at least one element selected from the group consisting of Cu, Mg, Zn, Pb, Cr, Al, In, Bi, Co and Ni and the contact temperature is from
25 100 to 350°C.

18. A process for producing 1,1-difluoroethane, comprising the following steps:

(1) a step of reacting 1,1-dichloroethane with
30 hydrogen fluoride in the presence of a fluorination catalyst to obtain a product containing mainly 1,1-difluoroethane,

(2) a step of introducing the product containing mainly 1,1-difluoroethane obtained in the step
35 (1) into a first distillation tower, separating mainly hydrogen chloride from the top, separating a side-cut fraction mainly comprising 1,1-difluoroethane and

containing a slight amount of hydrogen fluoride from the middle portion, separating mainly hydrogen fluoride, 1,1-dichloroethane and 1-chloro-1-fluoroethane from the bottom, and circulating the bottom product to the reaction step, and

(3) a step of bringing the side-cut fraction (crude 1,1-difluoroethane) obtained in the step (2) into contact with a fluorination catalyst in a gas phase state.

19. A process for producing 1,1-difluoroethane, comprising the following steps:

(1) a step of reacting 1,1-dichloroethane with hydrogen fluoride in the presence of a fluorination catalyst to obtain a product containing mainly 1,1-difluoroethane,

(2) a step of introducing the product containing mainly 1,1-difluoroethane obtained in the step (1) into a first distillation tower, separating mainly hydrogen chloride from the top, and separating mainly hydrogen fluoride, 1,1-dichloroethane, 1,1-dichloroethane and 1-chloro-1-fluoroethane from the bottom,

(3) a step of introducing the bottom fraction obtained in the step (2) into a second distillation tower, separating crude 1,1-difluoroethane containing mainly hydrogen fluoride from the top, separating mainly hydrogen fluoride, 1,1-dichloroethane and 1-chloro-1-fluoroethane from the bottom, and circulating the bottom product to the reaction step,

(4) a step of bringing the crude 1,1-difluoroethane containing mainly hydrogen fluoride, which is the top fraction obtained in the step (3), into contact with a fluorination catalyst in a gas phase state, and

(5) a step of recovering hydrogen fluoride from the reactant obtained in the step (4).